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ABSTRACT

This publication, the sixth in a series of seven for elementary schools, is an environmental education curriculum guide with a focus on waste management issues. While children may be unable to resolve other environmental problems litter is cited as one pollutant that they can comprehend and solve. They can learn to dispose of waste properly, help recycle some items, and come to understand how their own behavior affects the environment. The activities included in this unit use waste management to facilitate an environmental awareness and sense of environmental responsibility. The unit presents the following major ideas: (1) there are many cycles in nature; (2) some recycling occurs naturally; (3) a number of modern, man-made products cannot be recycled naturally and must be recycled by people; (4) resource recovery is a process that can decrease landfill problems and save money and energy; (5) recycling helps conserve important resources; and (6) some man-made items necessary to our society are not always easy to recycle. Each activity in the unit meets the Virginia Department of Education Standards of Learning Objectives for Science; however, the material is designed to be interdisciplinary and may also be used to meet social studies, health, language arts, mathematics, or art requirements. A list of additional resources (articles, magazines, educational curricula) is included. (MCO)

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# OPERATION WASTE WATCH
# THE NEW THREE RS FOR ELEMENTARY SCHOOL

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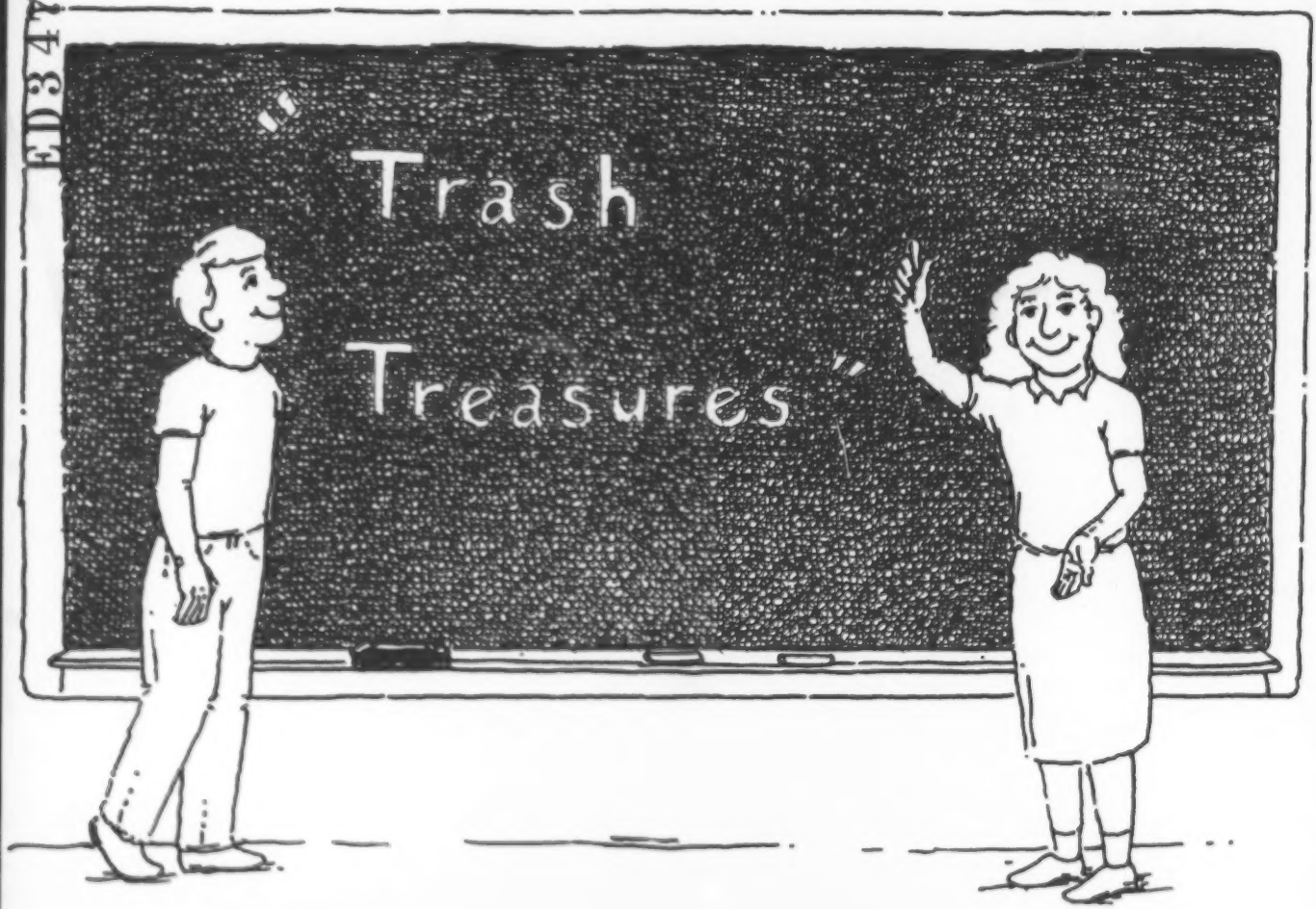


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## GRADE 5



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# OPERATION WASTE WATCH THE NEW THREE RS FOR ELEMENTARY SCHOOL

## Grade 5 Foreword

Ten years ago, the Division of Litter Control developed a curriculum for elementary schools called Operation Waste Watch, an environmental education curriculum with a focus on waste management issues. The seven grade level, multi-media units have been widely used in classrooms across the state and are considered a national model for environmental education. Each unit came with a number of peripheral teaching aids, including film strips, classroom posters, and coloring or comic books, which emphasized the theme of the unit and were designed to be taken home by the students, thereby extending and strengthening the original messages of litter control and recycling.

The instructional core of the unit was in the activity cards which presented several lessons for class or individual participation. Each teacher could select among the activities incorporating only that material which he or she wished to use. **Operation Waste Watch** materials were designed to be interdisciplinary and may be used to meet science, social studies, health, language arts, mathematic, or art requirements. Activities in the fifth grade level of Operation Waste Watch correlate with several of the science objectives, as well as more generally with social studies, language arts and art objectives.

This new edition of our curriculum comes in a markedly different package: a Teacher's Workbook, rather than the slip case filled with materials. Our annual surveys showed that the film strips while desired, were rarely used. The cards were hard to keep track of. The original format was never designed for refills, continual orders, or maintaining over a period of time. Many unit components got lost or strayed. As teachers moved to other schools, **OWW** moved in bits or pieces. After ten years, it was time to update the bibliography and modify some of the activities to take into account the current state of the world of solid waste. All these conditions translate into a simpler format which will be easier to order and use. We hope you will enjoy this second edition of **Operation Waste Watch: The Elementary New Three Rs.**

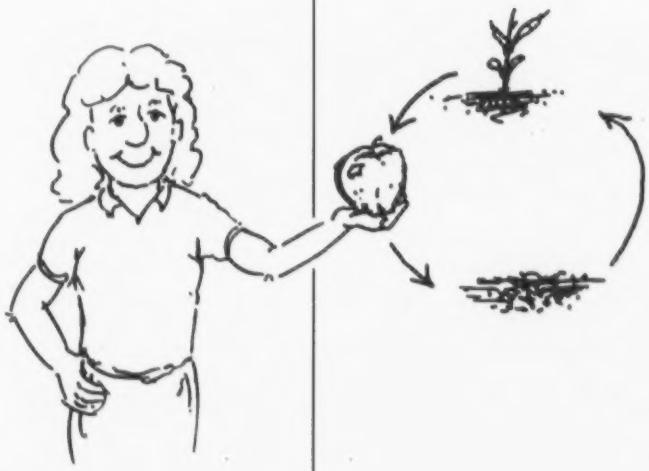
# NEW THREE RS FOR ELEMENTARY SCHOOL

The theme of the fifth grade unit is **Trash Treasures.** Students discover that while many things are recycled by nature, quite a number of modern products must be recycled by people. They learn that recycling and resource recovery can help save important resources which are often lost when items are tossed into a trash receptacle. Major ideas of the fifth grade unit include:

- There are many cycles in nature.
- Some recycling occurs naturally.
- A number of modern, man-made products cannot be recycled naturally and must be recycled by people.
- Resource recovery, removing usable materials from solid waste, is a process which can decrease landfill problems and save money and energy.
- Recycling, using recovered materials to manufacture new things, helps conserve important resources.
- Some man-made items necessary to our society are not always easy to recycle.

At the completion of this unit the students will be able to complete the recycling pattern of one natural substance or event. They will be able to complete the recycling pattern of one man-made substance. Students will be able to define a few key terms associated with recycling processes and solid waste management. Students will recognize that people are responsible for disposing of waste properly and designing new systems for handling their refuse. Students will also be able to recognize that people can use their imaginations to invent new uses for what formerly had been considered waste objects.

Litter is a very accessible pollution and one even very young children can comprehend. Children may be able to do very little to solve other environmental problems, but they can learn to dispose of waste properly, help recycle household and classroom items, and come to understand how their own behavior affects the environment. A waste management unit is an excellent place to begin creating environmental awareness. From this step, young people can develop a strong sense of environmental responsibility.



The disposal of our solid waste in an environmentally sound manner is becoming increasingly difficult. In the past ten years, over 70 percent of the landfills in this country have been closed. Siting new landfills meets with community resistance for economic as well as environmental reasons. Waste to Energy facilities are also extremely costly and raise concerns about air pollution. One reason that recycling has met with such public approval is that it allows people to do something positive that impacts upon the problem. Children particularly are quick to grasp the possibilities created by both source reduction and recycling, and rise to the idea of recycling very quickly.

Fifth graders can understand the principles of cycles in nature, and the recycling and reuse of materials in their own communities. They also understand that proper containerization of trash in the first place is even more important since that will keep the materials in the reclamation system.

The program will meet the following Standards of Learning Objectives for Science as presented by the Virginia Department of Education:

## 5.2

The students will identify problems or questions and construct valid hypotheses which can be tested.

## 5.3

The students will identify the controlled (manipulated) variable and the variables which are held constant in a simple experiment.

## 5.5

The student will participate in determining and evaluating his/her individual role in science activities.

## 5.15

The student will trace the complete life cycles of some plants and animals including their death and decomposition.

Many of the other content areas have objectives which are met through the activities of this unit.

## Social Studies

### 5.8

The student will describe the effects of technology on the development of American society.

## Health

### 5.15

The student will identify safety hazards and be responsible for reporting them.

## Language Arts

### 5.1

The student will use oral communication skills in a variety of situations.

### 5.3

The student will determine logical relationships found in reading selections.

### 5.9

The student will express feelings and ideas in writing.

### 5.13

The student will use a variety of reference sources to locate information and solve a problem.

## Art

### 5.2

The student will identify symbols and themes which artists have used in their work.

### 5.8

The student will add decorative textures to artwork.

### 5.12

The student will develop skills for describing art products.

### 5.13

The student will compare art forms what reflect the uniqueness of the culture from which they arise.

Classroom sets of comic books entitled "Save A Can When You Can" may be ordered from the Department of Waste Management by classroom teachers. Please allow three weeks for delivery.

**Contact:**

Materials Technician
Department of Waste Management
Eleventh Floor,
James Monroe Building
Richmond, Virginia 23219
804/786-8679

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# TRASH TREASURES

## Useful Creativity

(SOL Objectives Science 5.2, 5.3, 5.5; Language Arts 5.1; Art 5.8, 5.12, 5.13; Health 5.15)

For the period of one week, or over the block of time that the class is doing a unit on **Trash Treasures**, have each member of the class maintain a list of all the items they see at home or littered in the environment which could be recycled or reused. Ask the children to identify the material the object is made from, where the object was found, and the new use for each object. To wind up the unit, have each student make a presentation explaining their ideas. You might want to award the student with the longest list, the most useful ideas, and/or the most creative recycling and reuse ideas.

As another aspect of this presentation, have students make a sculpture using several empty aluminum or bimetal beverage cans, a newspaper, and strong glue. Each sculpture should be titled.

Another approach to reuse is to have for the class to select from a large group of empty containers. Include coffee cans, dog or cat food tins, juice and other food cans or bottles, milk jugs (especially in the quart size,) tissue boxes, and whatever else is available. Tell the students to select from the containers, decorate, and put to use in a new and attractive way. These can be displayed and judged by the class. Ingenuity and utility should be the criteria.

## Food Chain Game

(SOL Objectives Science 5.3, 5.5, 5.15, 3.16)

### You will need the following materials:

3 to 4 liters of popped corn

plastic sandwich bag for each of about 3/4 of the total number of students

roll of 1 inch wide masking tape

cloth sashes of three different colors: the most should represent grasshoppers, and about equal numbers of the two colors representing frogs and hawks.

Playground or lawn space, about 15 meters square

### How to Play the Game

Put a piece of the masking tape on each sandwich bag 4 cm from the bottom of the bag. Spread some of the popcorn over the lawn area. The popcorn represents the food that grasshoppers eat. About half of the class will be grasshoppers, wearing the grasshopper sash. Their job is to put the popcorn into their plastic bags. Divide the remaining students about equally into frogs and hawks, wearing their representative sashes. The frogs also get sandwich bags.

When the action starts, frogs will try to tag (eat) grasshoppers, and hawks will try to tag (eat) frogs. Grasshoppers can only eat plants, represented by the popcorn, frogs eat only grasshoppers, and hawks eat only frogs.

# TRASH TREASURES

When a frog tags a grasshopper, the frog should empty the grasshopper's popcorn into his or her own plastic bag. When a hawk captures a frog, the hawk takes the plastic bag and the popcorn away from the frog.

Explain to the children that animals in a natural setting have to think about getting food and not getting caught themselves all the time. Also point out that if the hawks eat all the frogs before the frogs eat any grasshoppers, then a lot of fat grasshoppers will eat up all the popcorn and then have no more food, and lots of hawks will also soon be very hungry. Start the game by saying, "Now get something to eat without being eaten yourself." It will take a couple of rounds before the children become adept at balancing both eating and being eaten.

In the game, for a grasshopper to survive, he or she must have popcorn up to the bottom of the tape. For a frog to survive, popcorn must fill its bag to the top of the tape. Hawks must have at least the equivalent of one frog with sufficient food to survive. At the end of the round, those without sufficient food must join the tagged animals on the sidelines.

The game should be repeated until a balance is achieved. A balance in the popcorn-grasshopper-frog-hawk system means that one hawk for each two frogs and two grasshoppers survives. Make such modifications as are necessary to ensure that a balance is achieved. You may change percentages of grasshoppers to frogs to hawks. Participants may also want to use safety zones where the creature is safe from being caught, or vary starting times.

# Back in the Classroom

Diagram the food chain on the board using the numbers of each animal remaining when a balance was reached.

Popcorn — grasshopper (4) — frog (4) — Hawk (2)

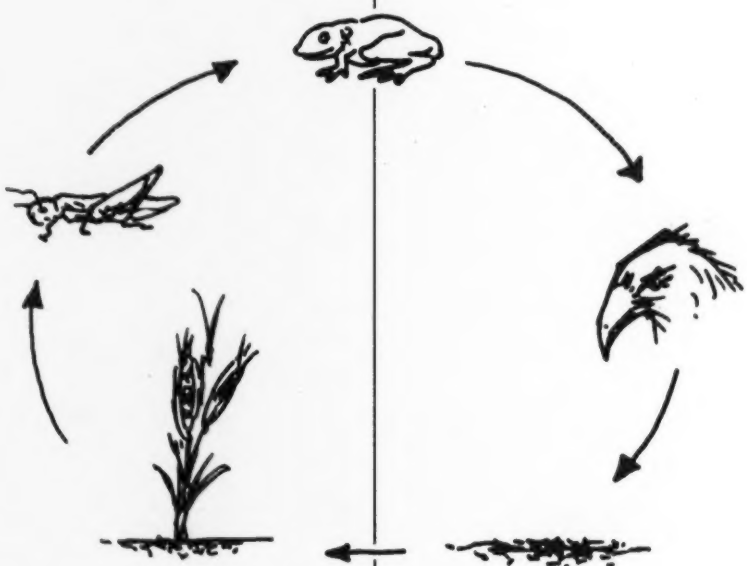
A food chain is a type of natural cycle or a nutrient recycling pathway. When a hawk dies, its body decomposes or biodegrades. Tiny plants and animals, bacteria and fungi feeders, in the soil cause the body to decompose. The nutrient energy from the hawk's body going into the soil will help feed new plants. Thus the nutrients are recycled in this food chain cycle. Nutrients pass from the soil into the corn plant, making it thrive and producing corn ears. When the grasshopper eats the corn, the food energy passes into the grasshopper, making it strong and healthy. When the frog eats the grasshopper, the food energy goes to it, and then to the hawk when it eats the frog. When the hawk dies, the nutrients go back into the soil again.

In the class discussion, include the following questions.

1. What would happen if we used only half as many pieces of popcorn in our game?

2. If there were no frogs, what would happen to the corn plant population? The grasshopper population? The hawk population?

3. What are some food chains which include people?

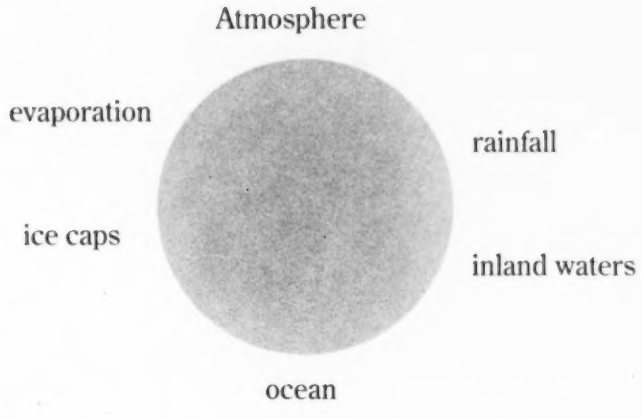


# TRASH TREASURES

## Water Cycle

(SOL Objectives Science 5.15; Language Arts 5.1)

Below is illustrated another cycle. Duplicate it for the students or draw it on the chalkboard. Ask the students to show how this cycle is similar to the nutrient recycling pathway (food chain.)




## Newspaper Cycle

(SOL Objectives Science 5.15; Social Studies 5.8; Language Arts 5.1, 5.13)

As a class, construct a cycle for a piece of newspaper. Two possible cycles can be drawn. The first starts with dissolved raw materials in the soil and goes to trees, newspapers, and finishes at the landfill. A problem with this cycle is that decomposition is slow to virtually a standstill in a landfill. Discuss with the students why this is so.

**Reference:** recent articles in *National Geographic*, *Atlantic*, or *Garbage* magazines by William Rathje, who is taking core samples from many landfills around the country. Newspapers dated twenty and thirty years ago are still readable and in good condition, albeit a little browner in color.

A second cycle begins with the raw materials dissolved in the soil and goes to trees, newspapers, recycling center. What might happen to the paper there? Which is the more continuous cycle?

Extend this idea by substituting an aluminum can. Ask the class what happens in the cycle when it is constructed around something which will not biodegrade.

# Energy Recovery

(SOL Objectives Science 5.2, 5.5, 5.15; Social Studies 5.8; Health 5.15; Language Arts 5.1)

Discuss with the class the idea of burning refuse. When some wastes are incinerated, heat energy can be recovered. Assist the students drawing the energy recovery system. A number of these plants are in operation in Virginia: as a part of the Southeast Public Service Authority operation in Portsmouth, in Fairfax County, in Galax, and in Harrisonburg. What are some advantages of using municipal solid waste instead of fossil fuels (oil or coal?)

### Additional activities:

Have the class split into groups of four or five. Each of the groups should choose a cycle, such as food chain or energy, or the seasons to depict through pantomime. Each group should present its silent skit to the rest of the class which will then name the cycle being shown.

# Sell It!

(SOL Objectives Language Arts 5.3, 5.9, Art 5.2, 5.8, 5.13)

Have the students develop a commercial promoting recycling. It should take about a minute to present and be suitable for either radio or television. You may choose to have the class work in small groups and present their combined efforts or have the students work individually, turn in their efforts, and you select the best and those that offer a range of reasons, types of recycling, and variety of approaches. When creating commercials, students should consider their audience: children (younger than they are), teenagers, adults. Humor works well as a selling tool, but sincerity or tough are also good.

### Additional activities:

Symbols are widely used in advertising. Remind or show the class the recycling symbol — the chasing arrows. Each arrow stands for an aspect of recycling: collecting, manufacturing, and purchasing. Encourage commercials to go beyond the concept of collection.

Another idea is to sell the idea of recycling aids. Can crunchers, bins, home collection stations, bag holders, and paper racks are all available to the householder.

# TRASH TREASURES

## Changing Waste Habits

SOL Objectives Science 5.3, 5.5; Language Arts 5.1; Social Studies 5.8)

Most people have had the habit of putting all their trash in one trash can. Once people are involved in recycling programs, they must begin to separate recyclables from non-recyclables. What sort of separation system do members of the class who are recycling at home use? If the school has begun a recycling program, how are the materials separated? Have the students discuss plausible alternatives.

**Extending the lesson.** Not long ago, milk was sold in reusable glass containers. The milkman brought milk to each house in glass bottles. He took away the empties, which the household rinsed and put on the porch or in the box provided for that purpose, brought them back to the dairy to be washed and refilled with milk.

### Discuss with the class:

Why did we stop using this system in the United States? Would it be hard to revert to this system now? Why? Elicit from the class: the time it took for the milkman to make his deliveries, the gasoline he used, wear and tear on the vehicle, the time and money it cost to sterilize the bottles. Raise these questions: Could or should we start using glass bottle which we bought in and returned to the store? What are strong points and weak points? What about the plastic jugs? Does anyone have ideas what can be done with them?

If your locality is involved in recycling already, have the students find out what sort of collection system is being used. What materials are being recycled? Why have these materials been selected? Are some recyclable materials omitted? Why? Does the local program anticipate adding further materials in the future? How are the materials prepared for collection? What happens to the collected materials?

Another research project for your class is to find out what products are readily available in your community that are made from recycled materials. Why is it important to buy goods made from recycled materials? (Because this is the only way the markets for recycled goods will expand. Business tends to provide what the customers want.) Does the school use products made from recycled goods? Does the local government buy products made from recycled goods? What are the reasons for why or why not?

## Writing Assignment:

### The Visitor from Outer Space

(SOL Objectives Language Arts 5.9)

A visitor from another planet lands its spaceship in a football stadium after a game. It sees candy wrappers, hot dog wrappers, soft drink cups, and a wide variety of other wastes littered all over the empty stands. But it doesn't see any people.

Make up a story about what the space visitor might think about any creatures that live on Earth. What might it tell its friends and neighbors and governors back on its own planet about earth people?

# ADDITIONAL RESOURCES

## Articles:

Rathje, William; "Once and Future Landfills;" *National Geographic*, May 1991; published by the National Geographic Society, Washington, DC.

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Rathje, William; "The Garbage Crisis;" *Atlantic Monthly;* December 1989.

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"Reading, Writing, and Recycling, A Catalog of Education Materials;" *resource RECYCLING,* December 1990, published by Resource Recycling, Portland OR 97209.

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"Recycling Makes the Grade in Schools," *Reusable News,* Spring, 1990; United States Environmental Protection Agency; RCRA Information Center, 401 M Street S. W., Washington DC 20460.

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"The Trashing of Virginia;" series of articles printed in the Richmond *Times Dispatch;* August 26-29, 1990; Richmond Newspapers, Inc.; Richmond VA 23261.

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## Magazines:

*Garbage: The Practical Journal for the Environment;* published bi-monthly by Old House Journal Corp.; 435 Ninth Street, Brooklyn NY 11215.

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*resource RECYCLING: North American's Recycling Journal;* published monthly by Resource Recycling, Inc.; 1206 N.W. 21st Avenue, Portland OR 97209.

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*Waste Age;* published monthly by the National Solid Waste Management Association; Suite 1000, 1730 Rhode Island Avenue, N.W., Washington DC 20036.

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## Educational Curricula:

*A Curriculum Activities Guide to Solid Waste and Environmental Studies (K-12);* Institute for Environmental Education; 3200 Chagrin Boulevard, Cleveland OH 44124.

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*Garbage In America;* Refuse Industry Productions, Inc.; P. O. Box 1011, Grass Valley CA 95945.

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*Garbage Reincarnation: Curriculum Guide (4-6);* Garbage Reincarnation, Inc.; Post Office Box 1375, Santa Rosa CA 95402.

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*Let's Recycle* (K-6, 7-12); The United States Environmental Protection Agency; Public Information Center, 401 M Street, S.W., Washington DC 20460.

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*Mobius Curriculum: Understanding the Waste Cycle (4-6);* Browning Ferris Industries, Inc.; 8607 Roberts Drive, Suite 100, Atlanta GA 30350.

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*New Three Rs: Reduce, Reuse, and Recycle (6-12);* Virginia Department of Waste Management; Eleventh Floor, James Monroe Building, Richmond VA 23219.

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*People and Their Environment (1-3, 4-6);* A conservation project of the National Council of State Garden Clubs, ?Brentree Environmental Center; Brentree Farms, Inc., Milford PA; published by Bayberry Press; Port Washington NY.

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*Project WILD (K-6);* contact Virginia State Coordinator Suzie Gilley, Wildlife Education Specialist; Department of Game and Inland Fisheries; P. O. Box 11104, Richmond VA 23230-1104.

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*Save It! Easy Environmental Tips to Save the Earth;* developed by Corporation for Public Broadcasting; published by Custom Print, Inc.; 2611 Shirlington Road, Arlington VA 22206.

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*Think Earth Environmental Education Program (K-3, 4-6 available 1992);* Educational Development Specialists; Think Earth Customer Service, 5505 East Carson Street, Suite 200, Lakewood CA 90713.

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*Waste: A Hidden Resource (7-12);* Keep America Beautiful, Inc.; 9 West Broad Street, Stamford CT 06902.

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*Waste In Place (K-7):* Keep America Beautiful, Inc.; 9 West Broad Street, Stamford CT 06902.

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# Other Information:

*The Fourth R:* An Implementation Guide for School Recycling and Solid Waste Management; produced by Association of Vermont Recyclers; P. O. Box 1244, Montpelier VT 05601.

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*How to Set up a School Recycling Program;* produced by the Council for Solid Waste Solutions; 1275 K Street N. W., Suite 400, Washington DC 20005.

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*Setting Up a Solid Waste Recycling Program in Schools;* J. Winston Porter; produced by McDonald's Corporation; One McDonald's Plaza, Oak Brook IL 60521.

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